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Patent

Docket No.: SPSN-E0365

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: YANG

Application No.: 09/805,273

Examiner: ESTRADA, M.

Filed: 03/13/2001

Art Unit: 2823

For: A METHOD OF FORMING HIGHLY CONDUCTIVE SEMICONDUCTOR STRUCTURES VIA PLASMA ETCH

Commissioner for Patents  
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Sir:

Transmittal of an Appeal Brief  
(Under 37 CFR §1.192)

☐ Transmitted herewith is the APPEAL BRIEF in this application with respect to the Notice of Appeal filed on: 06/05/2006

- ☒ The application is on behalf of other than a small entity  
☐ The application is on behalf of a small entity.  
A verified statement of small entity status is attached.  
A verified statement of small entity status has been previously filed herein.

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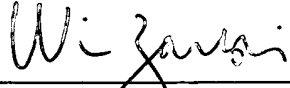
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Respectfully submitted,

Date: August 11, 2006

By:   
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appellant:	Yang, W.	Patent Application
Application No.:	09/805,273	Art Unit: 2823
Filing Date:	March 13, 2001	Examiner: Estrada, M.
For:	A METHOD OF FORMING HIGHLY CONDUCTIVE SEMICONDUCTOR STRUCTURES VIA PLASMA ETCH	

APPEAL BRIEF

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Serial No.: 09/805,273

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### 1. Real Party in Interest

The real party in interest is Spansion LLC. The current assignee is Advanced Micro Devices, Inc.

### 2. Related Appeals and Interferences

There are no related appeals or interferences known to the Appellant.

### 3. Status of Claims

Claims 27-35, 37-38 and 40-43 are pending. Claims 27-34 are withdrawn. Claims 35, 37-38 and 40-43 have been rejected. This appeal involves Claims 35, 37-38 and 40-43.

### 4. Status of Amendments

An amendment has not been filed subsequent to the final rejection.

### 5. Summary of Claimed Subject Matter

Independent Claim 35 pertains to a process for making a semiconductor structure (please see Figure 4) that has a lower electrical resistance and a shorter vertical profile than conventional structures (page 3, line 22, through page 4, line 2). With reference to Figures 3 and 4, a conductive adhesive layer 104 comprising polysilicon is deposited on a substrate 103 comprising silicon-oxide/silicon nitride/silicon oxide (ONO), and a conductive layer 105 is deposited over the conductive adhesive layer 104 (page 6, lines 15-29, and page 7, lines 12-13). The conductive adhesive layer 104 has a minimum thickness required to provide adhesion between the substrate 103 and the conductive layer 105 for a robust structure that can withstand subsequent processing (page 7, lines 4-9).

In particular, the conductive adhesive layer 104 has a thickness that is greater than 10 Angstroms and less than 100 Angstroms (page 4, lines 21-23). A portion of the conductive layer 105 and the conductive adhesive layer 104 are etched using a plasma etchant (page 8, lines 22-23). The etchant includes chlorine and oxygen (page 11, lines 12-13). The plasma is ionized by a first RF source and accelerated by a second RF source (page 9, lines 10-12). The etching is conducted at a pressure between 2 mTorr and 4 mTorr (page 10, lines 19-20).

According to Claim 37, the conductive layer 105 and conductive adhesive layer 104 have a combined thickness of less than or equal to approximately 300 Angstroms (page 8, lines 12-14).

According to Claim 38, the conductive layer 105 includes a material such as tungsten or tungsten silicide (page 7, lines 13-15).

According to Claim 40, the chlorine flow rate is approximately 40 sccm to 100 sccm (page 11, lines 15-16).

According to Claim 41, the oxygen flow rate is approximately 4 sccm to 12 sccm (page 11, lines 16-17).

According to Claim 42, the first RF source power is approximately 800 watts to 1500 watts (page 12, lines 1-2).

According to Claim 43, the second RF source power is approximately 50 watts to 150 watts (page 12, lines 2-3).

#### 6. Grounds of Rejection to be Reviewed on Appeal

Claims 35 and 38 are rejected under 35 U.S.C 103(a) as being unpatentable over Kunikiyo (U.S. Patent No. 6,639,288) in view of Mui et al. ("Mui;" U.S. Patent No. 6,037,265) in further view of Applicant's Admitted Prior Art (AAPA).

Claims 37 and 40-43 are rejected under 35 USC 103(a) as being unpatentable over Kunikiyo in view of Mui in further view of AAPA in further view of Examiner's comments.

#### 7. Arguments

The following arguments are applicable to Claims 35, 37-38 and 40-43.

According to independent Claim 35, a "conductive adhesive layer has a minimum thickness required to provide adhesion between said substrate and said conductive layer for a robust structure that can withstand subsequent processing, wherein said conductive adhesive layer has a thickness that is greater than 10 and less than or equal to 100 angstroms," where the conductive adhesive layer comprises polysilicon and where the conductive adhesive layer is disposed between a conductive layer and a substrate comprising ONO. Claims 37-38 and 40-43 are dependent on Claim 35.

The final rejection of Claim 35 relies on Kunikiyo to teach the limitations cited above. The final rejection states that Kunikiyo discloses a conductive adhesive layer having a thickness of between 50 and 300 Angstroms, and thus Kunikiyo allegedly discloses the claimed range.

However, Appellant respectfully asserts that Kunikiyo does not show or suggest a conductive adhesive layer having a thickness of between 50 and 300 Angstroms. According to the final rejection, Kunikiyo's polysilicon side wall 5 is equated with the claimed conductive adhesive layer. Appellant can find no mention in Kunikiyo, either explicitly or implicitly, of a thickness of between 50 and 300 Angstroms for polysilicon side wall 5 or, for that matter, any other polysilicon structure disclosed by Kunikiyo. The final rejection does not cite where such a range can be found in Kunikiyo. Appellant respectfully requests that, if the rejection of independent Claim 35 and its dependent claims is to be maintained, then the portion of Kunikiyo that shows or suggests a thickness of between 50 and 300 Angstroms for a conductive adhesive layer comprising polysilicon, where the conductive adhesive layer comprises polysilicon and where the conductive adhesive layer is disposed between a conductive layer and a substrate comprising ONO, be identified.

A dimension of Kunikiyo's side wall 5 can possibly be deduced from Figure 2 of Kunikiyo, for example. In Figure 2, side wall 5 appears to be slightly thicker than the thickness of insulating film 3. According to Kunikiyo, insulating film 3 has a thickness of about 100 nm, or 1000 Angstroms (please see column 10, lines 61-62, of Kunikiyo). Thus, side wall 5 would also appear to have a



thickness of at least 1000 Angstroms, which is greater than the claimed range of 10 to 100 Angstroms.

In summary, Appellant respectfully submits that Kunikiyo does not show or suggest a “conductive adhesive layer [that] has a thickness that is greater than 10 and less than or equal to 100 angstroms.” By similar rationale, Appellant respectfully submits that Kunikiyo does not show or suggest a “conductive adhesive layer [that] has a minimum thickness required to provide adhesion between said substrate and said conductive layer for a robust structure that can withstand subsequent processing” as recited in independent Claim 35.

Appellant also respectfully submits that neither Mui nor AAPA shows or suggests these claimed limitations. Mui teaches a polysilicon layer 16 that ranges in thickness from 300 to 8000 Angstroms (please see column 6, lines 9-10, of Mui). AAPA discloses a conductive adhesive layer of 1000 Angstroms or more.

Thus, Appellant respectfully submits that Kunikiyo, Mui and AAPA, alone or in combination, do not show or suggest the limitations of independent Claim 35. Consequently, Appellant respectfully submits that the basis for rejecting Claim 35 under 35 U.S.C. § 103(a) is traversed and that Claim 35 is in condition for allowance. As such, Appellant respectfully submits that the basis for rejecting Claims 37-38 and 40-43 under 35 U.S.C. § 103(a) is also traversed as these claims are dependent on an allowable base claim and recite additional limitations.

## 8. Conclusions

Appellant believes that Claims 35 and 38 are patentable over Kunikiyo in view of Mui et al. in further view of AAPA, and that Claims 37 and 40-43 are patentable over Kunikiyo in view of Mui in further view of AAPA in further view of Examiner's comments.

Appellant respectfully requests that the rejection of Claims 35, 37-38 and 40-43 be reversed.

Dated: 8/11, 2006

Respectfully submitted,

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Appendix I – Clean Copy of Claims on Appeal

1-26. (Canceled).

27. (Withdrawn) A plasma, comprising chlorine atoms and oxygen atoms at a pressure of between about 2 mTorr and about 4 mTorr, wherein said plasma is formed by a decoupled plasma source.

28. (Withdrawn) The plasma of claim 27, wherein said decoupled plasma source has a flux source power of about 800 watts to about 1500 watts and a plasma bias power of about 50 watts to about 150 watts.

29. (Withdrawn) A method of making a plasma, comprising feeding gases comprising chlorine and oxygen to a decoupled plasma source, and wherein the plasma is produced at a pressure of between about 2 mTorr and about 4 mTorr.

30. (Withdrawn) The method of Claim 29, wherein chlorine is provided at a flow rate of between about 40 and about 100 sccm, and oxygen is provided at a flow rate of about 4 to about 12 sccm.

31. (Withdrawn) The method of claim 29, wherein said decoupled plasma source has a flux source power of about 800 watts to about 1500 watts and a plasma bias power of about 50 watts to about 150 watts.

32. (Withdrawn) The method of claim 30, wherein said decoupled plasma source has a flux power source of about 800 watts to about 1500 watts and a plasma bias power of about 50, watts to about 150 watts.

33. (Withdrawn) A method of etching, comprising etching with the plasma produced by the process of claim 29.

34. (Withdrawn) A method of etching, comprising etching with the plasma produced by the process of claim 32.

35. (Previously Presented) A process for making a semiconductor structure comprising:

depositing a conductive layer upon a substrate comprising a silicon oxide-silicon nitride-silicon oxide (ONO) layer;

depositing a conductive adhesive layer comprising polysilicon between said substrate and said conductive layer, wherein said conductive adhesive layer has a minimum thickness required to provide adhesion between said substrate and said conductive layer for a robust structure that can withstand subsequent processing, wherein said conductive adhesive layer has a thickness that is greater than 10 and less than or equal to 100 angstroms; and

etching a portion of said conductive layer and a portion of said conductive adhesive layer utilizing a plasma without sacrificing said substrate, wherein said plasma comprises an etchant, wherein said etchant comprises chlorine and oxygen, wherein said plasma is ionized and sustained by a first RF source, and wherein said plasma is accelerated by a second RF source, wherein said etching is conducted at a pressure of between 2 mTorr and 4 mTorr, wherein a

selectivity of said etching obviates a need for an adhesive layer of greater than 100 angstrom thickness, and wherein said process yields a semiconductor structure comprising a lower electrical resistance and a shorter vertical profile than a semiconductor structure comprising a conductive adhesive layer of greater than 100 angstrom thickness.

36. (Canceled).

37. (Previously Presented) The process of Claim 36, wherein said conductive layer and said conductive adhesive layer have a combined thickness of approximately 3000 angstroms or less.

38. (Previously Presented) The process of Claim 35, wherein said conductive layer comprises a material selected from the group consisting of tungsten and tungsten silicide.

39. (Canceled).

40. (Previously Presented) The process of Claim 35, wherein a flow rate of said chlorine is approximately 40 to 100 sccm.

41. (Previously Presented) The process of Claim 35, wherein a flow rate of said oxygen is approximately 4 to 12 sccm.

42. (Previously Presented) The process of Claim 35, wherein said first RF source is approximately 800 to 1500 watts.

43. (Previously Presented) The process of Claim 35, wherein said second RF source is approximately 50 to 150 watts.

44-55. (Canceled).

### Appendix II – Evidence

There is no evidence entered and relied upon in this appeal.

### Appendix III – Related Proceedings

There are no proceedings identified as related appeals and interferences.